Motivation, Personality and Pokémon: A Personal Projects Analysis (PPA) investigation into motivation and exercise gaming.

A thesis submitted in partial fulfilment of the requirements for the degree of Master of Arts in Psychology at the University of Canterbury

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1. Abstract

In 2016, the mobile phone game Pokémon Go was launched. In the span of a few weeks this would go on to be one of the most popular games on IOS and Android and result in its players walking millions of kilometres as part of the game. In order to better understand why Pokémon Go was such a hit, we looked at how the game affects the motivation of its players. Participants were undergraduate psychology students (N = 128) at the University of Canterbury. Participants were randomly assigned into either a just walking condition or a walking with Pokémon Go condition. After walking the same ten-minute path, participants completed a Personal Projects Analysis questionnaire. Results showed that individuals with low self-control, low self-esteem and higher levels of depression achieved higher motivation scores after playing the game than those who did not play Pokémon Go on their walk. These findings suggest that Pokémon Go and games like it could be useful for helping increase motivation in those with low self-esteem or self-control, and higher depression. Implications and future directions are further considered.

2. Motivation, Personality and Pokémon: A Personal Projects Analysis (PPA) investigation into motivation and exercise gaming.

2.1 Pokémon Go

Released on 6 of July, 2016, Pokémon Go is an augmented reality game played on mobile phones and tablets. This game requires its players to go outside and walk to play, as opposed to sedentary tasks. By moving with their phone, each player's 'real world' movement controls the movement of their digital avatar in the game. Players help their avatar to catch 'Pokémon' (i.e. digital animals), which are then ticked off from their index (Pokédex) and can be used to control digital objectives known as gyms. Players can catch Pokémon at random GPS coordinates and hatch them by walking specific distances. At the time of its release, Pokémon Go was the most downloaded and played app in the world. This was highly impressive due to its slow initial release, being only available initially in Japan, New Zealand, Australia, and the United States. Pokémon Go has become one of the most successful mobile games to date, with record numbers of players socialising and exercising together all over the globe (Dogtiev, 2018).

Research has shown that Pokémon Go increased people's daily physical exercise substantially, with players increasing their average daily step count by around 25% (Althoff, White & Horvitz, 2016). This was the case regardless of gender, age, weight status, and prior activity levels. Due to its widespread appeal and its ability to promote increases in exercise levels, it has the potential to motivate people into doing physical activity. By slowly raising their baseline of fitness via playing Pokémon Go, people can be encouraged to undertake a healthier lifestyle. For people who are not motivated towards traditional exercise, this eases

them into a routine which is not as intimidating as an exercise class and gives them positive social reinforcement at the same time.

Research has shown exercise to be useful in the treatment of depression (Blumenthal et al, 1999; Byrne & Byrne, 1991; Taylor, Sallis and Needle, 1985) as well as self-esteem (Opdenacker, Delecluse & Boen, 2009) and weight loss (Ross et al, 2000). In our modern society, exercise rates are falling as people struggle to find the time to be active during their everyday lives (Brownson, Boehmer & Luke, 2005; Church et al, 2011). Due to Pokémon Go's ability to stimulate additional exercise activity, this could be an effective counter to sedentary activity brought about by our modern lifestyles.

2.2 The game industry and its influence

While the amount of time people spend exercising is dropping, sedentary computer games are increasing in consumption and popularity. Although people might think video games are exclusively played by youth, studies have shown gaming as a whole appeals to a larger segment of the population. In Australia, for example, the average age of video game players has increased to 36 years of age, and 88% of households have at least one game device in the home (Brand, Borchard, & Holmes, 2009). This study also found that a large number of parents who were surveyed in the study were players (70%). In one case study, the average age for players in the game Everquest was 27.9 years old, with 33% of the players over the age of 31 (Griffiths, Davies & Chappell, 2004). Players in the study were located in 22 different countries around the world, indicating that gaming devices are quite widely spread across many ages and demographics. Gaming has also become a competitive sport and is highly profitable. High profile players are paid large amounts of money for advertising and tournament games. At the 2017 DotA 2 (Defence of the Ancients) 'International' tournament, the prize pool was $24.7 million USD. The winning team earned

$10.6 million USD, which was divided by the 5 main players, the coach, and support staff/reserves (Dota 2 Prize Pool Tracker, The International 2017). The vast sums of money and number of viewers who follow competitive video games shows the strength of this industry. People from all over the world play videogames and utilising their enthusiasm to play games will make it much easier for people to embrace a product which helps them with their health.

With the widespread consumption of video games worldwide, researchers have raised concerns about what effects this can have on individuals. King, Delfabbro & Griffiths (2010), examined the convergence of digital gambling and computer games. They noted that a large number of video games had incorporated a variety of monetary and non-monetary forms of gambling within their designs. This is problematic as it provides people with easy access to gambling in a non-regulated environment. This can be especially damaging among isolated teens (Gupta and Derevensky, 2008). With the release of the DSM-5 in 2013, the American Psychiatric Association officially assigned Internet Gaming Disorder (IGD) as a "condition for further study" (American Psychiatric Association, 2013). As such IGD currently has no diagnostic criteria, however research indicates that those who suffer from it play computer games compulsively, to the exclusion of other interests. They experience withdrawal symptoms when they are unable to play, yet their recurring gaming results in significant impairments and distress. Their devotion to gaming affects their work, personal and social lives. Initial understanding of the disorder show people affected by IGD to have greater risks of obesity, mood disorders, vitamin D deficiencies, and other health problems associated with sedentary behaviours. More recently, the World Health Organisation has decided to include IGD in the yet to be released, International Classification of Diseases 11th edition (ICD-11) (World Health Organisation, 2018). Studies have also indicated possible links between

violent games and aggressive behaviour (Anderson & Bushman, 2001; Griffiths, 1999; Anderson et al., 2010).

Although videogames may have some problematic issues due to their popularity and high consumption, it seems unlikely that people will stop playing them. Rather than attempting to prohibit access to video games, which would achieve little success, it seems beneficial to focus on finding ways to reduce the harm they cause and if possible to generate positive outcomes. Pokémon Go and games like it, have the potential to have positive aspects, with its social and exercise-based rewards.

2.3 The negative effects of sedentary behaviours

Pokémon Go has the potential to be a powerful tool in the battle against unhealthy levels of sedentary behaviour, due to its ability to get individuals to be more active. Currently, chronic physical inactivity is the second leading cause of preventable death globally, having the potential to lead to obesity as well as other health complication (WHO, 2013). Those suffering from obesity are at a far greater risk of diabetes, musculoskeletal diseases, cardiovascular diseases, and some cancers (WHO, 2013). Physical inactivity is estimated to cost $53.8 billion USD globally and has helped contribute to the rising levels of depression and obesity (WHO, 2013). In 2014, more than 1.9 billion adults aged 18 years and older weighed more than their ideal body weight, with nearly a third of these individuals being obese (WHO, 2013). In New Zealand, around 33% of the adult population can be classified as obese, a value that continues to rise. The childhood obesity rate, while significantly lower is still high at 11% (Ministry of Health, 2017). The World Health Organisation (WHO, 2013) indicates that the global obesity epidemic has been brought about by a greater consumption of energy dense, high fat foods. This, paired with reduction of

exercise induced by increases in urbanisation, advances in transportation, and an increase in sedentary work environments, has contributed to the increase in obesity to what it is today (WHO, 2013).

A study investigating the exercise levels of American school children found 20% of children did not engage in vigorous exercise three or more times a week (Andersen, Crespo, Bartlett, Cheskin & Pratt, 1998) and 26% of children watched four or more hours of television per day. Children who were exposed to large amounts of screen time also had a significantly higher average amount of body fat and body mass index (on average 2 points greater BMI than children watching less television). Although obesity is not only driven by food consumption and lack of exercise, these are the aspects that are the most practical to address.

For those who suffer from obesity, this problem can have a large impact on their lives. In a study by Schwimmer, Burwinkle and Varni (2003), quality of life (QOL) scores of obese children and teenagers were compared to children and teenagers undergoing chemotherapy and healthy children. Obese children reported lower QOL scores than healthy children and had similar QOL scores to those undergoing chemotherapy. The authors noted obese children were more likely to have lower perceived capabilities on social abilities as well as physical appearance and physical prowess, resulting in lower levels of perceived individual worth. The obese children were much more likely to show impairment in psychosocial health, 5.9 times more in their self-report and 13.6 times via a parental report (Schwimmer et all, 2003). Compared to children of average weight, obese children had much worse mental health. Children with obesity were more likely to miss school days, especially around evaluations (Schwimmer et all, 2003). Obesity is seen as a socially unacceptable disease in childhood, with large amounts of bullying and negative attention directed towards overweight children (See Puhl & Latner, 2007 for a review).

With the amount of negative attention that occurs around obesity, it seems to make sense that an individual's self-worth and self-esteem could be affected by obesity. In a study by Strauss (2000), it was found that across a 4-year period several demographics of obese children had developed significantly lower self-esteem than their peers. At the beginning of the study, 9-10-year-old children rated themselves on their self-esteem. The same children were followed up after 4 years and it was found that obese boys had a mild decrease of self-esteem and both obese white and Hispanic girls had significantly lower self-esteem than their non-obese counterparts. It has also been shown that increases in exercise can improve self-esteem (Ekeland, Heian & Hagen, 2005). Due to the possible effects self-esteem could have on Pokémon Go, it is worth us investigating how self-esteem effects motivation while playing Pokémon Go.

Fortunately for some individuals, the effects of obesity can be decreased by using strategies to reduce their weight. Getting people to increase their exercise can reduce the health problems caused by their sedentary lives. By using a fun and novel method such as Pokémon Go, it could make it much easier for these people who lack motivation to get outside and exercise. While this may not work for all individuals who suffer from obesity, it has the potential to be beneficial for some.

2.4 Depression and Hokomori

Pokémon has the potential to help with other issues, due to its social interaction aspects. Depression in society is also on the rise. The World Health Organisation notes that more than 300 million people of all ages suffer from depression world-wide (WHO, 2018). Depression itself is the leading cause of disability globally and has been linked with changes in our environment such as obesity, diet, physical activity, light, sleep and social environment

(see Hidaka, 2012). In the United States, the estimated economic cost of depression was $83.1 billion dollars in 2000 (Greenburg et al, 2003). In a literature review by Lambert (2006), lifestyle changes over the 20th century were examined across epidemiological studies conducted in the 1970s, and those who were born in the early part of the century were less likely to be depressed. This was attributed to the reductions of agricultural workers in the workforce (38% in 1900 to 3% in 2000) and the increase of service jobs (31% in 1900 to 78% in 2000). Exercise has been shown to reduce depressive symptoms (Dunn & Dishman, 1991) and does so in a dose-based method (Dunn, Tivedi, Kampert, Clark & Chambliss, 2005). It has also been shown that exercise can be as effective as antidepressants in the treatment of depression (Blumenthal et al, 2007).

Tatenoa, Skokauskasc, Katod, Teof and Guerreroi (2016) discuss the implications of Pokémon Go in Japan. Currently 230,000 people in Japan are estimated to suffer from Hokomori or severe social withdrawal. The authors discuss how Pokémon Go can help get people, previously housebound by internet addiction and social withdrawal, out on the streets and communicating with each other. The authors suggest that mental health support facilities specialising in Hokomori could incorporate Pokémon Go into their facility (by making their office an in-game objective). This could get people out of their homes and into these facilities where they can receive the help and support they need. Pokémon Go has the potential to get these people the motivation and social interaction to get them out of their homes, allowing people an opportunity to help themselves manage their symptoms.

In a related vein, The University of Auckland has helped to develop a game specifically targeted to children and adolescents who suffer from mild to moderate depression (Merry et al, 2012). In the game ‘SPARX’, players control a digital avatar whose goal is to complete objectives and defeat the negative thoughts, the game’s antagonists, called Gnats. The players are supported by a guide who, as the game progresses, teaches the player to use

skills both in and outside of the game, attempting to help players to feel better, solve problems and enjoy life in the real world. In a clinical trial with youth suffering from depression, SPARX was as effective as traditional treatment, and moderate depression, SPARX treatment was more effective at reducing depressive symptoms (Merry et al, 2012). SPARX was effective across all ethnic, gender groups and the range of ages (12-19 years) studied. Games like these are particularly attractive treatment options because they are easy to use, cost effective and can be accessed from home. By using a game design, participants can simply receive therapy from their own safe areas, be it school, home or with friends/or family. For families on a budget and unable to secure constant funding, it is a low cost, once off investment. As a result of this clinical trial SPARX is now supported by the NZ Ministry of Health and partnerships between Youthline and Lifeline have been created, to achieve greater support for those in need. However, SPARX is highly limited in terms of its reach. The game is solely available in New Zealand and can only be downloaded from the website, requiring prior knowledge of its existence. The game is targeted for depression and as a result, SPARX is only used as a treatment tool and not for prevention. It is also explicitly targeted at a youth audience and has not been clinically tested on adults. This where Pokémon Go and the games industry have such massive advantages as their products can be easily accessed by a wide number of people. There are also the augmented reality aspects that could prove useful at improving the health of the players. Due to the success of SPARX in treatment for people with depression, it is of interest to see if video games have a greater appeal to those with higher levels of depressive symptoms and if using such a medium would increase their motivation.

2.5 The link to self-control

The fact that depression and obesity rates are both on the rise suggests that an underlying mechanism may be due to deficits in self-control. Theories have been tested around the link between self-control and depression (Rehm, 1977; Fuchs & Rehm 1977). Several studies have also linked impulse control problems, such as over eating and substance abuse, to deficits in self-control. Peluso, Ricciardelli, and Williams (1999) found links between poor self-control, problem drinking and problem eating patterns among college students (see Baumeister, Heatherton & Tice, 1994, for review). Male students struggle to control their alcohol consumption while female students have problems regulating their food intake (e.g., Heatherton, 1993; Heatherton & Baumeister, 1991; Johnston, O'Malley, & Bachman, 1991). In a study by Stewart and Bernhardt (2010), students born after 1987 had significantly lower levels of self-control than those born prior to 1987. This is similar to the pattern seen in the rise of depression and obesity, indicating some relationship may be present. Impulse control has been linked in the DSM to addictive behaviours, such as gambling, substance abuse, excessive food consumption, and excessive internet use. Since poor self-control is linked to many negative behaviours, Pokémon Go and games like it could help those lacking self-control, to conduct more healthy behaviours. Using such an addictive tool, such as video games, combined with its ability to manipulate real world actions, it could be used to help reduce the side effects of playing too much video games and replace it with something else. By removing this negative addiction with an addiction that generates positive behaviours, you could help to improve the lives of those with self-control issues.

2.6 Motivation

As of yet, no research has been conducted on the motivational processes that occur when people play augmented reality games, such as Pokémon Go. At their most basic level, these games are a variable ratio reinforcement schedule, which offers digital reinforcement for the completion of physical and digital tasks. Variable ratio schedules tend to result in high levels of responses from participants (Catania, Mathews, Silverman & Yohalem, 1977) and due to their continued rewards, have greater resistance to extinction (Hearst, 1961). In combination with its gaming nature, players are focused on the design aesthetic and in-game content, rather than what it requires them to do. This allows Pokémon Go to be more successful at enticing people to complete exercise tasks compared to traditional methods, allowing people across all types of groups to engage in its paradigm (Althoff et al, 2016). Some research has created models to describe the motivation of gamers. In Yee et al (2007), a three-part model of gamer motivation was created, where the player was influenced by achievement, social interaction and immersion. This model specifically looked at the motivation of each gamer to continue playing the game and was targeted to a genre of game, Massively Multiplayer Online games (MMO's). There was higher achievement focus among male players and a higher social focus among female players. While Pokémon Go is a not an MMO, it does incorporate achievement and immersion within its design. It also promotes social interaction with other players in the real world by including cooperative objectives. However, this theory is only focused on the motivation of the games player base and what motivates them to play. This theory would not extend beyond the game and as such further exploratory research is required.

2.7 Goals of this research

The purpose of this study was to find out what affect Pokémon Go has on players' motivation and if certain groups are more or less motivated after playing Pokémon Go. If Pokémon Go is a reinforcement schedule, it should affect motivation. Due to the unresearched nature of Pokémon Go we used an exploratory study with many questionnaires assessing variables such as self-control, self-esteem, personal projects and depression. These variables are known to be related to motivation and could moderate effects on the relationship between motivation and Pokémon Go. Due to the lack of research on the relationship between motivation and video games, we did not have specific directional hypotheses. However, based on the literature previously investigated, we expected that Pokémon Go would affect motivation and be moderated by the personality variables.

3. Method

3.1 Participants

This study was approved by the Human Ethics committee at the University of Canterbury. One hundred and twenty-eight students (98 female and 30 male, M = 23, SD = 6.627) took part in the study. The majority of participants (118) were recruited as part of their enrolment in the 200 level Personality Psychology course offered by the University of Canterbury. They were offered course credit for participation. An additional 10 participants were recruited as paid participants, having their time compensated with a $10 Westfield voucher. Participants were asked to have Pokémon Go installed on their phones before the start of the experiment. Participants were excluded if their phones were incapable of running Pokémon Go, unless they used a backup cell phone provided. Two participants required use of the backup phone and no participants were excluded from the study. Participants were

given an information sheet prior to beginning the study, which outlined the tasks they would be participating in and written consent was obtained.

3.2 Materials

3.2.1 Personality Questionnaires

In this study we generated two questions of our own, one to indicate the play experience of participants and another to indicate their current activity levels. We also used the following questionnaires, which used a 5-point scale for ease of use, adapted from the original scoring. Participants completed a questionnaire to measure their self-esteem (Rosenburg, 1965), their self-control (Tangney et al, 2004), depression (Radloff, 1977) and motivation (Little, 1989). Additional questionnaires were used in this study but were not included in the analysis. (see below)

Self-esteem scale self-esteem (RSE) - Generated in 1965, the RSE is a 10-item measure of self-esteem. Each question is scored on a 1-5 Likert scale with 1 being strongly disagree to 5 being strongly agree. Sample questions from this measure include "I feel that I'm a person of worth, at least on an equal basis with others" and "I am able to do things as well as most other people" (M = 3.42, SD = .70, Cronbach's alpha = .903).

Self-control scale - First published in 2004, the self-control scale is a 13-item measure of self-control. Each item is scored on a 1-5 Likert scale with 1 being strongly disagree to 5 being strongly agree. Sample questions include "I do certain things that are bad for me, if they are fun" and "People would say that I have iron self-discipline" (M= 2.80, SD=.65, Cronbach's alpha = .870).

Center for Epidemiological Studies-Depression (CES-D) - Originally published in Radloff (1977) the CES-D has been used by individuals to state the level which they experience symptoms of depression over the past few weeks. Each item is scored on a 1-5

Likert scale with 1 being strongly disagree to 5 being strongly agree. Examples of questions used in the CES-D "I had trouble keeping my mind on what I was doing" and "I felt that everything I did was an effort" (*M*=2.85, *SD*=.55, Cronbach's alpha = .749).

Personal Projects Analysis (PPA) - Personal projects analysis has been used as a flexible measure to measure individuals' motivation towards personal goals and projects. Participants are asked to generate a list of current goals in their lives and then select the top three most important goals. Participants rated these goals on 16 different dimensions assessing how motivated they were about their goals. This has been used in many domains and contexts in motivational psychology. Due to the high levels of flexibility in the measure, PPA does not have a fixed method for analysis. However, I averaged ratings on 8 items that clearly relate to motivation and had an alpha that showed strong internal consistency (alpha = .650). These items were determination, persistence, greater good, absorption, enjoyment, meaning and likely to succeed. Example questions include "I am eagerly determined to accomplish this project." and "I will persist over obstacles and hardships if necessary with this project." (M = 3.42, SD = .83; Cronbach's alpha = .805).

The following questionnaires that were not included in our analysis were the Quest Rumination Subscale (of Rumination-Reflection, Quest; Trapnell & Campbell, 1999). BIS/BAS (Carver & White, 1994), Perceived Stress Scale (Cohen et al., 1983), Attachment Style (Hazan & Shaver, 1987) and the Big 5 Ten-Item Personality Inventory (Gosling et al., 2003). An EEG analysis was conducted as well but not included in this analysis.

3.2.2 Presentation of Materials

The paradigm was presented through the software E-Prime 2.0. E-Prime presented timed screens, response recordings and task event codes, which allowed a connection between the

tasks occurring on E-Prime 2.0 and the EEG readings. The questionnaire materials were presented through the Qualtrics interface.

3.3 Procedure

3.3.1 Introduction to the study

The experiment was run with up to four participants per session. As each participant entered, the experimenter ensured that Pokémon Go was able to be installed on each participant's cellular device. Afterwards participants received an information sheet which outlined the details of the study. Written consent was acquired to show that participants understood the study they were participating in and for their results and information to be used.

3.3.2 Experimental Procedure

First, participants answered the demographics and personality questionnaires. Once this was completed participants were fitted with a 14-electrode, quick application Bluetooth EEG headset (Emotiv EPOC+, Emotiv Systems Inc., San Francisco, CA, USA).

When participants were ready to begin, the electroencephalography (EEG) recording commenced and the E-prime software was started by the experimenter. Participants then completed a baseline recording for the EEG. Participants had to watch a white fixation cross for 30 seconds with their eyes open and then wait for 30 seconds with their eyes shut. They were given a noise cue when to open their eyes. This was then followed by an Auditory Startle Paradigm which inserted random, harsh blasts of white noise to produce a distinctive event-related potential component (P3a) that is susceptible to distress after social exclusion (Polich, 2007, Volpe). As part of the N2-P3 complex to auditory stimuli, the P3a peaks over fronto-central electrodes between ~250-350ms post stimulus, to counter any conflict identification that will harm a person's emotional state (Polich, 2007, Volpe, et al. 2007). In support of this, the P3a was source localized to the anterior cingulate cortex (ACC). This

region of the brain is linked with conflict detection, monitoring of performance, and negative affect (Crottaz-Herbette and V. Menon; 2006; Shackman et al., 2009; Volpe et al. 2007).

Next, participants were randomly assigned to one of two conditions. This was completed via E-prime to ensure that the experimenter did not know which condition the subject was included in. In the first condition, the participant was asked to go on a twelve to fifteen minute walk to a location on campus and back while playing 'Pokémon Go'. In the second condition, the participants walked the same route without playing 'Pokémon Go'. A visual prompt was left at the halfway point to ensure participants completed the entire walk. Participants were required to describe what they saw at the halfway point to the experimenter on their return to the lab. Following this, the EEG was again recorded during the resting state and auditory oddball tasks. For the primary dependent measure, the participants completed the Personal Projects Analysis (PPA). At the end of the experiment all participants were debriefed and thanked for taking part in the study. Due to problems in the recording, over 70% of the EEG data was incomplete. As a result, the EEG data was not analysed in this study.

4. Results

Twenty-three participants' data was excluded due to missing data. In order to reduce the amount of noise in the data, we conducted a reliability analysis in IBM's SPSS (version 25.0.0.1) with all sixteen items from the PPA. We removed the items with low Cronbach's alpha values (>.650), generating a list of eight dimensions (see table 1.) with strong alpha values and item correlations ($\alpha = 0.708$). These values were all relevant to motivation and showed strong internal consistency with our sample. Some of the items removed were not directly related to motivation, such as "I tend to think about this project in more abstract (e.g., success; health) than concrete (e.g., do well on test, lose weight) terms" or "I tend to feel self-

conscious when thinking about and doing this kind of project." This was used as our measure of each participant's motivation.

Table 1. PPA dimension reliability analysis

	Corrected Item-Total Correlation	Cronbach's Alpha if Item Deleted
Determination	0.550	0.663
Persistence	0.423	0.678
Greater Good	0.291	0.712
Absorption	0.451	0.669
Enjoyment	0.422	0.675
Meaning	0.464	0.664
Likely to Succeed	0.496	0.665
Likely to Procrastinate	0.265	0.708

Statistical analysis, using a one-way ANOVA between this motivation variable and experiment condition to see if playing the game directly affected motivation, indicated the relationship was approaching significance F(1 ,104) = 3.802 , 0 = .054.

4.1 Self-control

Several moderation analyses were run in the SPSS macro PROCESS (version 2) to investigate if there was any interaction between condition (Pokémon Go or control) and moderator on motivation. First using self-control as a moderator, the overall model was significant, r^2= .0960, p=.0158 (see table 2). The increase in R^2 due to the addition of the moderator was significant, r^2change=.0607, $F(1,102)$= 6.852, p=.0102. The moderation relationship was subdivided into low, mean and high scores of self-control from the participants' survey responses. People with low self-control who were in the Pokémon condition, scored higher on motivation than people with low self-esteem in the control

condition (see figure 1). As well, people with mean scores of self-control in the Pokémon group, also had higher scores on motivation than those with mean self-control in the control group (see table 3). Individuals who scored high on self-control obtained non-significant findings, indicating that those who showed high self-control had the same levels of motivation in the control and Pokémon groups.

Table 2. Self-Control moderation model summary

	β	Se	*T*	*P*
Constant	3.1450	.2507	12.5428	.0000
Self-Control	.1602	.0868	1.8458	.0678
Condition	1.0411	.3467	3.0029	.0034
Interaction	-.3126	.1194	-2.6176	.0102

Figure 1. Effect size across levels of self-control

Table 3. Effect of condition on PPA at different levels of self-control

Self-control	Effect	se	t	*P*
2.1676	.3635	.1115	3.2608	.0015
2.8267	.1574	.0789	1.9946	.0488
3.4858	-.0486	.1115	-.4364	.6635

4.2 Self-esteem

The same moderation process was then repeated, using self-esteem as a moderator in place of self-control (see table 4). This model was significant (r^2= .1092, *P*=.0079. The increase in R^2 due to the moderator was also significant (r^2change=.0386, *f*(1,102)= 4.4193, *p*=.0380). With separating self-esteem into low, mean and high levels, again low self-esteem scorers achieved higher motivation scores in the Pokémon condition (see figure 2) than low self-esteem participants in the control group. This also occurred among average self-esteem scorers, again with the Pokémon Condition scoring better on motivation than the control group (see table 5). Those with high self-esteem scores did not show a significant difference in motivation, regardless of their group condition.

Table 4. Self-Esteem moderation model summary

	β	Se	*T*	*P*
Constant	2.8835	.2522	11.4356	.0000
Self-Esteem	.2054	.0710	2.8940	.0047
Condition	.9559	.3776	2.5312	.0129
Interaction	-.2311	.1099	-2.1022	.0380

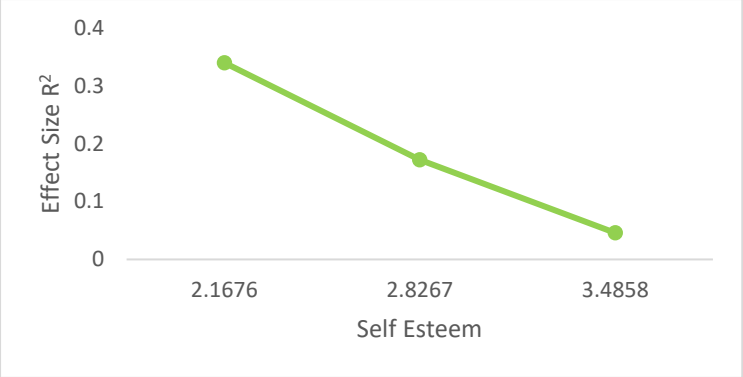

Figure 2. Effect size across levels of self esteem

Table 5. Effect of condition on PPA at different levels of self-esteem

Self-control	Effect	se	t	*P*
2.1676	.3406	.1101	3.0933	.5589
2.8267	.1726	.0789	2.1797	.3296
3.4858	.046	.1148	.9680	.2324

4.3 Depression

Low levels of self-esteem and self-control can be predictors of depression. In order to see if those with higher depressive symptoms were affected by playing Pokémon Go a moderation was run, with condition as a predictor of motivation scores and depression as a moderator (see table 6). This relationship was also significant r^2= .0769, p=.0420. The increase in R^2 due to the addition of the moderator was significant r^2change=.0370, $f(1,102)$= 4.0911, p=.0457. The moderation relationship was separated into low, mean and high levels of depression. Those who had higher depression scores (more severe symptoms) scored higher on motivation while playing Pokémon Go than those who didn't play (see figure 3). Participants with mean scores of depression, who played Pokémon Go, also performed better than those who did not. Again, this was at a reduced extent to those with higher depression

scores (see table 7). Those with the lowest scores for depression did not have a significant difference in motivation, regardless of whether they were playing Pokémon Go.

Table 6. Depression moderation model summary

	β	Se	*T*	*p*
Constant	4.1092	.2752	14.9325	.0000
Depression	-.6655	.4180	-1.5923	.1144
Condition	-.1830	.0966	-1.8932	.0612
Interaction	.2894	.1431	2.0226	.0457

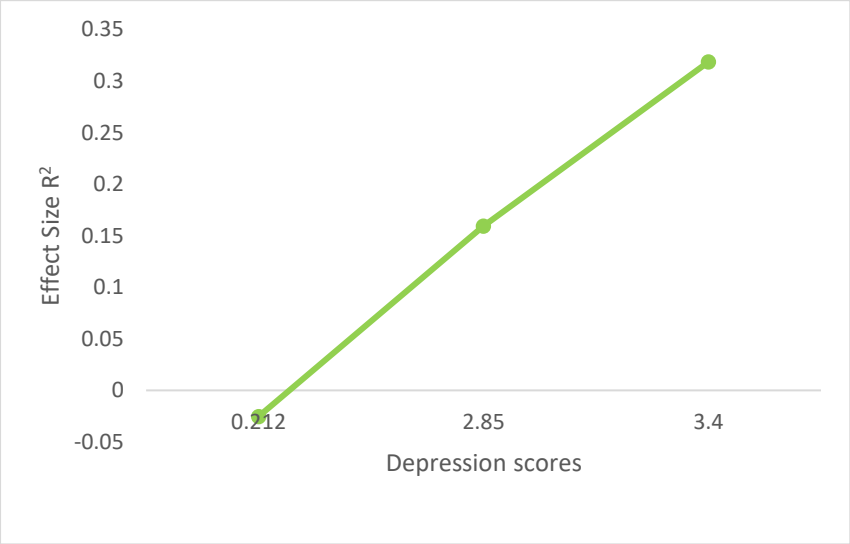

Figure 3. Effect size against depression scores

Depression	Effect	se	t	*P*
.2120	-.0253	.1233	-.2049	.8380
2.8500	.1594	.0803	1.9842	.0499
3.4000	.3186	.1108	2.8749	.0049

Table 7. Effect of condition on PPA at different levels of depressive symptoms

4.4 Controlling for covariance

As self-esteem, depression and self-control are interacting constructs, a correlation analysis was run to see how much overlap had occurred in our data. This measured correlation between self-control and depression as well as self-esteem and depression and self-esteem and self-control. Self-esteem had a strong negative correlation with depression, r=-.595, p=.000. Self-control had a weak negative correlation with depression, r=-.194, p=.028. Self-esteem and self-control had a moderate positive correlation, r=.322, p=.000, indicating moderate levels of interaction with each other. To try and tease apart this relationship the same moderation regressions were run as before, while statistically controlling for each of the other two variables.

First, the moderation analysis of motivation against condition with self-control as a moderator was replicated, but with self-esteem and depression entered as covariates, and the interaction was still significant, r^2= .1374, p=.0104 (see table 8). The value of the moderator relationship was strong, r^2change=.0562, f(1,101) = 6.5207, p=.0122. Both the mean and low self-control groups showed the same significant relationship (See figure 4 and see table 9).

Second, the moderation analysis of motivation against condition was repeated, with self-esteem as a moderator and self-control and depression as a covariate. This showed the interaction to still be significant, r^2= .1185, p=.0254, with a reduction in the strength of the relationship (see table 10). The value of the moderator relationship was strong, r^2change=.0373, f(1,101)= 4.2315, p=.0423. Both the mean and low self-control groups still showed the same significant relationship (see figure 5 and table 11).

After repeating the previous moderation regression, with depression as the moderator variable while using both self-esteem and self-control as covariates, the relationship was still significant, r^2= .1202, p=.0235. The increase in R^2 due to the addition of the moderator was

also significant r^2change=.0390, f(1,102)= 4.0911, p=.0378 (see table 12) . As before the moderation was separated into groups, indicating those with mean or high depression values scored higher for motivation when they were playing Pokémon Go than those with similar depression scores who did not (see figure 5 and table 11).

Table 8. Self-Control moderation model summary while controlling for self-esteem

	β	Se	*T*	*P*
Constant	2.5073	.5015	5.0000	.0000
Self-Control	.1110	.0898	1.2363	.2892
Condition	1.0342	.3433	3.0124	.0033
Interaction	-.3029	.1186	-2.5536	.0122
Self-esteem	.1554	.0726	2.1411	.0347
Depression	.0845	.0902	.9361	.3515

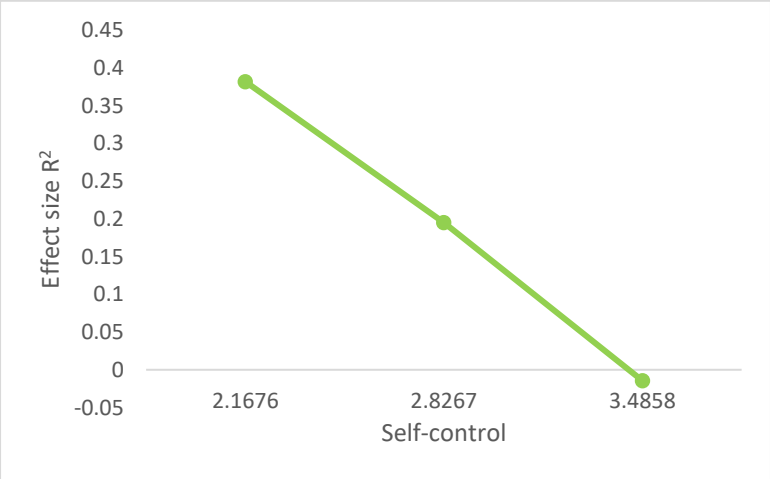

Figure 4. Effect size against levels of self-control, while statistically controlling for self-esteem and depression

Table 9. Effect of condition on PPA at different levels of self-control while controlling for self-esteem and depression

Self-control	Effect	se	t	*P*
2.1676	.3817	.1113	3.4296	.0009
2.8267	.1953	.0790	2.4729	.0151
3.4858	-.0144	.1098	-.1314	.8957

Table 10. Self-Esteem moderation model summary while controlling for self-control and depression

	β	Se	*T*	*P*
Constant	2.7308	.4854	5.6256	.0000
Self-Esteem	.2479	.0854	2.9011	.0046
Condition	.9454	.3801	2.4874	.0145
Interaction	-.2275	.1106	-2.0571	.0423
Self-Control	-.0529	.0634	-.8346	.4059
Depression	.0554	.0910	.6084	.2359

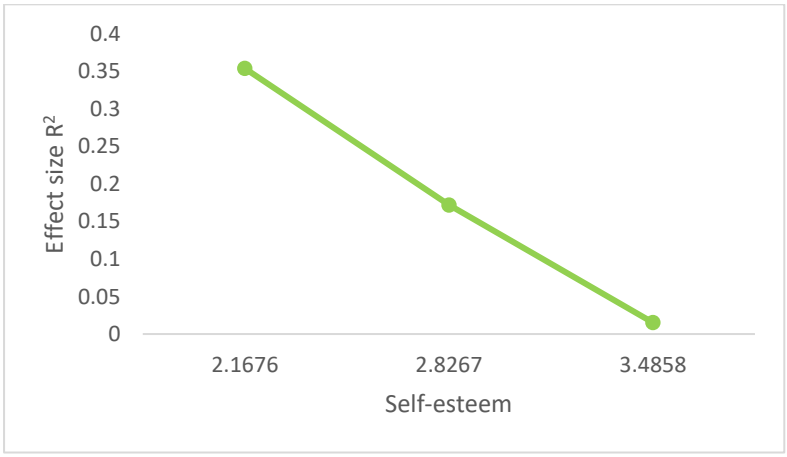

Figure 5. Effect size against levels of self-esteem, while statistically controlling for self-control and depression

Table 11. Effect of condition on PPA at different levels of self-esteem while controlling for self-control

Self-esteem	Effect	se	t	*P*
2.1676	.3538	.1158	3.0559	.0029
2.8267	.1718	.0798	2.1542	.0336
3.4858	.0153	.1133	.1348	.8930

Table 12. Depression model summary while controlling for self-esteem and self-control

	β	Se	*T*	*p*
Constant	3.4268	.5037	6.8029	.0000
Condition	-.6730	.4134	-1.6279	.1067
Depression	-.0722	.1118	-.6454	.5202
Interaction	.2981	.1416	2.1049	.0378
Self-esteem	.1597	.0733	2.1781	.0318
Self-control	-.0646	.0636	-1.0159	.3121

Table 13. Effect of condition on PPA at different levels of depressive symptoms while controlling for self-control and self esteem

Depression	Effect	se	t	*P*
.2120	-.0136	.1219	-.1115	.9115
2.8500	.1766	.0796	2.2191	.0287
3.4000	.3406	.1099	3.0984	.0025

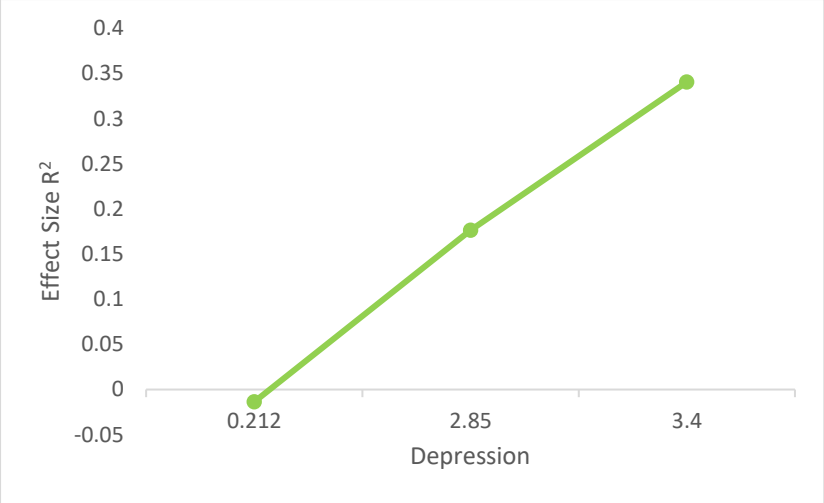

Figure 6. Depression while controlling for self-esteem and self-control

5. Discussion

In this study we investigated the motivational effects of playing Pokémon Go. Participants completed self-esteem, self-control and depression questionnaires before going for a short walk, either playing Pokémon Go or not playing it. After the walk, participants completed a Personal Projects Analysis questionnaire. Results showed that individuals who played Pokémon Go, who reported lower self-control and self-esteem, demonstrated higher motivation scores as compared to those in the control condition who reported low self-control and self-esteem. It was also found that participants with higher depressive values also achieved higher motivation scores while playing the game. Depression and self-esteem were moderately correlated, as were self-esteem and self-control. Self-control and depression were also significantly and weakly correlated. Individuals with high self-esteem, high self-control and low depressive symptoms did not increase their motivation while playing Pokémon Go. Unfortunately, due to the technical problems, we could not compare baseline motivation with post-condition motivation to see if these measures correlated before playing the game.

5.1 Implications

This research has the potential to be useful for those developing interventions for people who suffer from depressive symptoms, low self-esteem and/or self-control. Pokémon Go has already shown itself to be a useful tool for helping people to increase their daily physical steps (Althoff, 2016). Research has noted exercise to be a useful tool in the treatment of depression (Blumenthal et al, 1999) as well as self-esteem (Opdenacker et al, 2009). Pokémon Go has shown potential in not only increasing the physical activity undertaken by those with these issues, but also in helping participants increase their goal motivation. While additional research is required to confirm these findings, Pokémon Go has the potential as a tool in combating these issues. As discussed in Hidaka (2012), due to the rapid increase in technological development, modern society is more sedentary than in previous generations. This lack of physical activity has been linked with the rise in depression (Hidaka, 2012) and obesity (Crombie, Ilich, Dutton, Panton, & Abood, 2009; Keating, Guan, Piñero & Bridges, 2005). One of the big advantages that Pokémon Go has over traditional methods is how it is perceived by its players. Due to its fun aesthetic and the reinforcement schedule, players do not think of playing the game as a work task. It is designed to be an enjoyable experience which allows its players to play a traditional video game, with the added twist of being outside and encouraging exercise. Since it is also low cost, it is easy to utilise the game in almost any group size or condition to allow people to gain access to easy exercise. By playing Pokémon Go, this may help those struggling in motivation to both be more active and interact with other people. Tateno et al (2016), thought that Pokémon Go could be useful for helping to treat those with severe social withdrawal (Hokomori) by enabling them to leave their homes and get back out into the wider world. This study supports this view, with benefits for people with low self-control, low self-esteem and high depressive symptoms.

5.2 Limitations

There were several limitations in our research. First, the recording of the EEG measure had too much incomplete data to be useable. Recording of the markers was interrupted which meant that a large portion of this data was unusable. Second, we had no guarantee that our participants would play Pokémon Go for the entire walk. Participants could have developed technical difficulties during the walk which affected their experience or people in the control group could have decided to play Pokémon Go while they were not supposed to or using their phone in general when they shouldn't. Additionally, there was no guarantee that participants would walk the same route to get to the return point and back. While random assignment should account for this, having participants utilise a Virtual Reality (VR) or exercise machine adapted version of this study would solve these issues, reducing the variance in the data. Finally, our study was based around the Personal Projects Analysis, which is a highly flexible survey. While this was useful for allowing the study a measure of freedom it does have its drawbacks. PPA has no fixed method of analysis, along with not being a precise measure for motivation. This makes it hard to compare results, as well as having a lack of literature to compare with to see if our method of analysis is the best option to use.

5.3 Future research

Future research would be useful to determine the long-term effects of Pokémon Go on motivation. Though this study showed that people who played Pokémon Go with low self-esteem, self-control and high depressive symptoms were more motivated after playing Pokémon Go than those who did not, we do not know how long these changes would last or whether they would diminish over time. By conducting a study over larger time intervals this will give a better idea of whether the changes in motivation are long. This could also be paired with a health study, to see if playing the game long term improves other areas than just

motivation, such as health outcomes. Another potential research avenue is assessing which parts of Pokémon Go get the best motivational response, as this could allow researchers to use these aspects of the game to develop long term increases in motivation. Players could be restricted to certain parts of the game and tested to see which ones achieve the greatest increases in motivation. Finally, it would be worthwhile to replicate this study, successfully implementing the EEG component, to look at how participant's motivation centres would be directly affected by playing the game.

In summary, this study showed that individuals in the Pokémon Go condition who had low self-control, low self-esteem and high depression scores demonstrated higher motivation values than those who just walked. These findings have the potential for practical use by those creating interventions to improve motivation, granting them access to a low-cost enjoyable tool which could allow for greater success. Additional research is required to evaluate the extent of these effects.

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Appendix A- Ethics

HUMAN ETHICS COMMITTEE

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Email: human-ethics@canterbury.ac.nz

Ref: HEC 2017/88

5 September 2017

Hamish Bates
Psychology
UNIVERSITY OF CANTERBURY

Dear Hamish

The Human Ethics Committee advises that your research proposal "Motivation, Personality and Pokemon" has been considered and approved.

Please note that this approval is subject to the incorporation of the amendments you have provided in your email of 1st September 2017.

Best wishes for your project.

Yours sincerely

pp. R. Robinson

Associate Professor Jane Maidment
Chair
University of Canterbury Human Ethics Committee

Appendix B – Self-esteem

Please rate the extent to which each of the following statements generally applies to you.

	Strongly Disagree	Disagree	Neither Agree nor Disagree	Agree	Strongly Agree
I have a hard time breaking bad habits	●	●	●	●	●
I am lazy.	●	●	●	●	●
I say inappropriate things.	●	●	●	●	●
I do certain things that are bad for me, if they are fun.	●	●	●	●	●
I refuse things that are bad for me.	●	●	●	●	●
I wish I had more self-discipline.	●	●	●	●	●
I am good at resisting temptation.	●	●	●	●	●
People would say that I have iron self-discipline.	●	●	●	●	●
I have trouble concentrating.	●	●	●	●	●
I am able to work effectively toward long-term goals.	●	●	●	●	●
Sometimes I can't stop myself from doing something, even if I know it's wrong.	●	●	●	●	●
I often act without thinking through all the alternatives.	●	●	●	●	●
Pleasure and fun sometimes keep me from getting work done.	●	●	●	●	●

Appendix C – Self-control

Please rate the extent to which each of the following statements generally applies to you.

	Strongly Disagree	Disagree	Neither Agree nor Disagree	Agree	Strongly Agree
I feel that I'm a person of worth, at least on an equal basis with others	●	●	●	●	●
I feel that I have a number of good qualities.	●	●	●	●	●
All in all, I am inclined to feel that I am a failure.	●	●	●	●	●
I am able to do things as well as most other people.	●	●	●	●	●
I feel I do not have much to be proud of.	●	●	●	●	●
I take a positive attitude toward myself.	●	●	●	●	●
On the whole, I am satisfied with myself.	●	●	●	●	●
I wish I could have more respect for myself.	●	●	●	●	●
I certainly feel useless at times.	●	●	●	●	●
At times I think I am no good at all.	●	●	●	●	●

Appendix D – CES-D

Default Block

Please indicate the extent to which you've felt this way OVER THE PAST FEW WEEKS.

	Strongly Disagree	Disagree	Neither Agree nor Disagree	Agree	Strongly Agree
I was bothered by things that usually don't bother me.	●	●	●	●	●
I had trouble keeping my mind on what I was doing.	●	●	●	●	●
I felt depressed.	●	●	●	●	●
I felt that everything I did was an effort.	●	●	●	●	●
I felt hopeful about the future.	●	●	●	●	●
I felt fearful.	●	●	●	●	●
My sleep was restless.	●	●	●	●	●
I was happy.	●	●	●	●	●
I felt lonely.	●	●	●	●	●
I could not "get going."	●	●	●	●	●

Appendix E – PPA

Personal Projects Analysis

Now, we are interested in your personal projects. Most of us have a number of projects at any given time that we think about, plan for, and try to accomplish.

Here are some examples of such projects that people have listed in the past: try to be physically attractive; seek new and exciting experiences; try to avoid being noticed by others; earn as much money as possible; get A's in all my courses; help Gary get along better with others; make my parents proud of me; try to stop fighting in my relationship; clarify my religious beliefs; avoid being dependent on my boyfriend; try to avoid putting on weight; help and be kind to people; stay on top of house chores.

Please think about which personal projects matter most to you

Please enter which projects that are most characteristic of you at present, choosing the top three

Please select the three that are most important to you and write them in the boxes below.

If in the subsequent surveys these options are not loaded, please remember the order in which you placed them. Feel free to ask the experimenter for some paper if you don't think you'll remember the order

Project 1

Project 2

Project 3

Please rate your projects on each of following dimensions on the subsequent pages.

Strongly Disagree	Disagree	Neither Agree nor Disagree	Agree	Strongly Agree
1	2	3	4	5

I am eagerly determined to accomplish this project.

I am tenaciously committed to this project.

I will persist over obstacles and hardships if necessary with this project.

I will not neglect or procrastinate with this project.

External forces and factors beyond my control will determine the outcome of this project more than factors within my personal control.

This project focuses more on preventing bad outcomes that I want to avoid than getting good outcomes that I personally value.

I tend to think about this project in more abstract (e.g., success; health) than concrete (e.g., do well on test, lose weight) terms.

This project is more pragmatic than idealistic.

I tend to feel self-conscious when thinking about and doing this kind of project.

This project is focused more on priorities that are beyond myself than on priorities that are only self-related.

I tend to get so fully absorbed in this kind of project that I lose track of time and self-awareness.

This project requires compromise and respect for the views of important others or groups that differ from my own views.

I enjoy doing this kind of project.

In the big picture that includes my life, other people, and the world around us, this project feels meaningful.

This project is stressful.

This project is likely to succeed.

Appendix F- Rumination

Please rate the extent to which each of the following statements generally applies to you.

	Strongly Disagree	Disagree	Neither Agree nor Disagree	Agree	Strongly Agree
My attention is often focused on aspects of myself I wish I'd stop thinking about.	●	●	●	●	●
I always seem to be rehashing in my mind recent things I've said or done.	●	●	●	●	●
Sometimes it is hard for me to shut off thoughts about myself.	●	●	●	●	●
Long after an argument or disagreement is over with, my thoughts keep going back to what happened.	●	●	●	●	●
I tend to "ruminate" or dwell over things that happen to me for a really long time afterward.	●	●	●	●	●
I don't waste time rethinking things that are over and done with.	●	●	●	●	●
Often I'm playing back over in my mind how I acted in a past situation.	●	●	●	●	●
I often find myself reevaluating something I've done.	●	●	●	●	●
This item is included to check that participants are paying attention. Please choose "Agree" (4th option) for this item.	●	●	●	●	●
I never ruminate or dwell on myself for very long.	●	●	●	●	●
It is easy for me to put unwanted thoughts out of my mind.	●	●	●	●	●
I often reflect on episodes in my life that I should no longer concern myself with.	●	●	●	●	●
I spend a great deal of time thinking back over my embarrassing or disappointing moments.	●	●	●	●	●

Appendix G -Stress

Please rate the extent to which each of the following statements has applied to you OVER THE PAST MONTH.

	Strongly Disagree	Disagree	Neither Agree nor Disagree	Agree	Strongly Agree
I have often been upset because of something that happened unexpectedly.	●	●	●	●	●
I have often felt that I was unable to control the important things in my life.	●	●	●	●	●
I have often felt nervous and/or stressed.	●	●	●	●	●
I have often dealt successfully with irritating life hassles.	●	●	●	●	●
I have often felt that I was effectively coping with important changes that were occurring in my life.	●	●	●	●	●
I have often felt confident about my ability to handle my personal problems.	●	●	●	●	●
I have often felt that things were going my way.	●	●	●	●	●
I have often found that I could not cope with all the things that I had to do.	●	●	●	●	●
I have often been able to control irritations in my life.	●	●	●	●	●
I have often felt that I was on top of things.	●	●	●	●	●
I have often been angered because of things that happened that were outside of my control.	●	●	●	●	●
I have often found myself thinking about things that I have to accomplish.	●	●	●	●	●
I have often been able to control the way I spend my time.	●	●	●	●	●
I have often felt difficulties were piling up so high that I could not overcome them.	●	●	●	●	●

Appendix H- Attachement

These questions are concerned with your experiences in relationships in general.

Read each of the three self-descriptions below and then rate the extent to which you agree with each of them. (Note: The terms "close" and "intimate" refer to psychological or emotional closeness, not necessarily to sexual intimacy.)

	Strongly Disagree	Disagree	Neither Agree nor Disagree	Agree	Strongly Agree
I find that others are reluctant to get as close as I would like. I often worry that my partner doesn't really love me or won't want to stay with me. I want to merge completely with another person, and this desire sometimes scares people away.	●	●	●	●	●
I am somewhat uncomfortable being close to others. I find it difficult to trust them completely, difficult to allow myself to depend on them. I am nervous when anyone gets too close, and often, love partners want me to be more intimate than I feel comfortable being.	●	●	●	●	●
I find it relatively easy to get close to others and I am comfortable depending on them and having them depend on me. I don't often worry about being abandoned or about someone getting too close to me.	●	●	●	●	●

Appendix I- Personality

Please rate the extent to which each of the following statements generally applies to you.

	Strongly Disagree	Disagree	Neither Agree nor Disagree	Agree	Strongly Agree
I see myself as: Extraverted, enthusiastic.	●	●	●	●	●
I see myself as: Critical, quarrelsome.	●	●	●	●	●
I see myself as: Dependable, self-disciplined.	●	●	●	●	●
I see myself as: Anxious, easily upset.	●	●	●	●	●
I see myself as: Open to new experiences, complex.	●	●	●	●	●
I see myself as: Reserved, quiet.	●	●	●	●	●
I see myself as: Sympathetic, warm.	●	●	●	●	●
I see myself as: Disorganized, careless.	●	●	●	●	●
I see myself as: Calm, emotionally stable.	●	●	●	●	●
I see myself as: Conventional, uncreative.	●	●	●	●	●